Cryogenic photon counting spectrometers:
from astronomy to biology ?

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Astronomy has traditionally been a field driving photon detection techniques. Significant progress is expected provided large area arrays of cryogenic devices could be manufactured and placed in the focal plane of a telescope, for example. Modern cryogenic detectors allow energy resolving photon counting to be performed between approximately 1 eV and 10 keV. In this talk I shall discuss different photon detection schemes like the cryogenic micro-calorimeter, the superconducting tunneling junction or the magnetic micro-calorimeter. All these devices rely upon the fact that the energy of each absorbed photon can generate an experimentally detectable number of thermal, electronic or magnetic excitations at low temperature only. Measuring the number of excitations allows to measure the actual photon energy. Imaging arrays with a large number of pixels (say > 100) are difficult to realize mainly because each pixel needs still to be connected to a dedicated readout electronics. Multiplexing techniques are in their infancy and require an important R&D effort. Other fields of science can benefit from the improved sensitivity with a moderate number of cryogenic pixels already. Examples in biology will be given.